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# Finding Optimal Allocation of Constrained Cloud Capacity Using Hyperbolic Voronoi Diagrams on the Sphere

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## ABSTRACT

We consider a network of computer data centers on the earth surface delivering computing as a service to a big number of users. The problem is to assign users to data centers to minimize the total communication distance between compu-ting resources and their users in the face of capacity constrained datacenters. In this paper, we extend the classical pla-nar Voronoi Diagram to a hyperbolic Voronoi Diagram on the sphere. We show that a solution to the distance minimi-zation problem under capacity constraints is given by a hyperbolic spherical Voronoi Diagram of data centers. We also present numerical algorithms, computer implementation and results of simulations illustrating our solution. We note applicability of our solution to other important assignment problems, including the assignment of population to regional trauma centers, location of airbases, the distribution of the telecommunication centers for mobile telephones in global telephone companies, and others.

## KEYWORDS

Cloud Computing; Voronoi Diagram; Voronoi Diagram on the Sphere

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